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MICHAEL DELA HAYES - PA  
70 ROCKAWALL PLAZA  
NEW YORK, NY 10012

EXAMINER

ART UNIT

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.

09/413,774

Applicant(s)

ITO ET AL

Examiner

Sikha Roy

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 7 October 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-34 and 36-42 is/are rejected.
- 7) ☐ Claim(s) 10, 35 is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1 ☐ Certified copies of the priority documents have been received.
- 2 ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
- 3 ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 18) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

Acknowledgement is made of applicants' preliminary amendment (Paper # 5) received on December 29, 1999. However the amendments except the first one on Page 32, are objected to and have not been entered because they do not correspond to the correct line numbers. The preliminary amendments should be corrected as follows.

Page 38, lines 4, 5, 6, "data" should be changed to --specimen--.

Page 40, line 5, "data" should be changed to --specimen--.

Page 67, line 12, "less than -1%" should be changed to --more than -1%--.

Page 68, lines 14, 15, "less than -1%" should be changed to --more than -1%--.

Page 80, line 1, "less than -1%" should be changed to --more than -1%--.

### *Specification*

The abstract of the disclosure is objected to because it is long. Correction is required. See MPEP § 608.01(b).

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 - 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited.

The disclosure is objected to because of the following informalities:

Page 29, line13 replace " $\delta_0$ " by -- $\delta_0$ --.

Page 65, line22 replace "antistatoc" by --antistatic--.

Page 37, line 23 replace "second" by --secondary--.

Page 38, line1 replace "second" by --secondary--.

Appropriate corrections are required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5,6,19, 27-29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of U. S. Patent No. 5,939,822 to Alderson.

The applicants' admitted prior art discloses (pages 7,8 Fig. 36) an electron beam apparatus comprising a hermetic container including an electron source with electron emission devices and target (fluorescent film on faceplate) and a first member (structural supports referred to as spacer or rib). According to the backgrounds 2 and 3, the general formula (1) (page 23,lines 9,10) describes incident angle dependency of secondary electron emission coefficient  $\delta$ . It is further noted (page 24, lines 15-20) that incident angle multiplication coefficient of secondary electron emission coefficient

$m_0$  is larger than 10 provided the spacer has smooth surface with antistatic film and incident energy is 1keV being larger than first cross-point energy but smaller than second cross-point energy, first and second "cross-point" energies are the incident energies of electrons where  $\delta = 1$ .

Claims 1 and 27 differ from the applicants' background disclosure in the value of the parameter  $m_0$  being 10 or less, determined by conducting a regression analysis by the least square method using 20,40,60 and 80 degrees for values of incident angle  $\theta$  in the general formula.

Alderson in analogous art of support structures for flat panel displays teaches (column 5, lines 19,20,23-25) different techniques of altering the geometry of the surface of the support member, forming high resistivity conductive layer coated on the support member to reduce the secondary electron emission. This reduces the value of secondary electron emission coefficient  $\delta$  which reduces values of  $m_0$ .

Therefore it would have been obvious to one of ordinary skill in the art at the time invention was made, to modify the support member in the applicants' admitted prior art by the techniques disclosed by Alderson to reduce secondary electron emission from the surface of the supporting member. The value of  $m_0$  can be changed by process of experimenting with modified support members (spacers) for different values of incident angle  $\theta$  varying from 20 to 80 and then finding  $m_0$  equal to 10 or less using regression analysis by the least square method.

Claims 2 and 28 recite different value for  $m_0$ ,  $m_0$  being equal to or less than 5, essentially with same limitations as in claim 1 and 27. Therefore claims 2,28 are rejected for the same reason as claims 1 and 27. (see rejection of claim 1 and 27).

Referring to claims 3, 5,6 and 31 Alderson discloses (column 5 ,lines19,20) a part of the surface of the first member (support structure) fluted with grooves and channels so as to reduce the average coefficient of secondary electron emission. Fig. 8 illustrates the fluted surface of the support structure which reduces the secondary emission by the direct incidence and electron trapping. The fluting is parallel to the surface (column 7 lines 62-65) and alters the geometry of the surface of the spacer in relation to the electrostatic field lines such that most secondary electrons emitted by impinging electron will describe a trajectory back into the fluting rather than out of the fluting's mouth. This reduces secondary electron emission and hence the distortion of the electron beams in the display device.

Referring to claim 19 Alderson discloses the first members (supporting structures) are the spacers adjoining the cathode structure and the anode structure for maintaining spacing of the cathode and anode structures.

Claims 7 - 9,11,32,33,34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of U S Patent No 5 939 822 to Alderson and further in view of U. S. Patent no. 6,222,313 to Smith et al.

Claims 7, 8, 32,33 differ in that Alderson does not exemplify the average cycle of of the uneven geometry on the surface of the first member.

Smith et al. in related art of field emission device with spacers teach (column 3 lines 29-30) the rough surface characterized by a peak-to-valley number within a range of 0.5 – 6 micrometers which provides the effective period.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the surface of the spacer as disclosed by Alderson by the average cycle of roughness specified by Smith et al. in order to provide the uneven geometry for reducing electric discharges at rough surface.

Referring to claims 9 and 34 Smith et al. disclose (column 3 lines 31,32) the roughness of the surface characterized by the range of 0.5 – 3.2 micrometers.

It would have been obvious to one having ordinary skill in the art at the time invention was made to modify the average roughness range from 0.5 – 3.2 micrometers to 0.1 – 100 micrometers, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Referring to claim 11, 36 Smith et al. disclose (column 3 line 44, column 5 line 20) the surface of the first member (spacer) is roughened, roughness achieved by abrasion, the abraded surface defining a plurality of non-uniform peak-to-valley distances.

Claims 4 12 13 16-18 20-26 30 37 38 41 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of U. S. Patent No. 5,939,822 to Alderson and further in view of U. S. Patent no. 5,760,538 to Mitsutake et al.

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Referring to claims 4,26,30 and 42, Mitsutake et al. disclose (column 33 lines22-26,49) that on the substrate is formed the insulating member coated with the semiconductor film to a thickness of  $1000 \text{ \AA}$  ( $0.1 \text{ }\mu\text{m}$ ). Combining the teachings of Alderson and Mitsutake et al. it would have been obvious to one of ordinary skill in the art at the time of the invention, to have the surface of the spacer with uneven geometry be coated with the semiconductor thin film with thickness of  $0.1 \text{ }\mu\text{m}$ , smaller than the average roughness of the surface to reduce the problem of secondary emission along the surface.

Referring to claims 12,13,16,37,38 Mitsutake et al. disclose (column 9 lines26-28) that a semiconductor thin film is formed on the surface of the spacer which has a surface resistivity between  $10^5$  and  $10^{12} \text{ }\Omega / \square$ . With such high surface resistivity it can maintain the effect of preventing electrification of the surface. Materials that can be used for the semiconductor thin film (20b, Fig. 6) include silicon, germanium, metal oxides. The thin film may be formed by means of an appropriate film forming technique such as vapor deposition or dipping (column 9 lines 43-46).

Referring to claims 17 and 18 Mitsutake et al. disclose the spacer (20, Figs. 7A-7C) having a first film (semiconductor film 20b) and an electroconductive film (20c) formed in area to be made to abut the corresponding areas of the electron accelerating electrode (19) and the electron source (wiring 13 or 14), the conducting film (20c) being in contact with the first film (semiconductor film 20b, Fig.7c).

Referring to claims 20,21 Mitsutake et al. disclose (column 8 lines 34-37) an electrode (19 Fig.28) which accelerates the electrons emitted from the source. The



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voltage applied between the accelerating electrode 19 and the emitting source is between 3kV and 10 kV (column 24 line49).

Referring to claim 22, Mitsutake et al. disclose (column 9 lines2-5) the semiconductor thin film (20b Fig. 6) of each first member (spacer) being electrically connected to the controlling electrode (metal back 19) and row- or column-directed wiring (13 or 14) forming the electron source.

Referring to claim 23, Mitsutake et al. disclose (column 13 lines 5,6) the electron emitting source being cold cathode device.

Referring to claims 24 and 25, Mitsutake et al. disclose (column 3, lines28,51,52) that the image display apparatus comprises a target to be irradiated with electron beams producing images. The target is an image forming panel carrying fluorescent members.

Claims 14,15,39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of U. S. Patent No. 5,939,822 to Alderson and further in view of U. S. Patent no. 5,811,919 to Hoogsteen et al.

Hoogsteen et al. teach (column 2 line17,18,23) that a coating having a low secondary emission coefficient may be provided on the surface of the spacer to prevent unwanted secondary electron emission. It is further noted that a coating comprising of a metal oxide yields  $\delta$  values  $\leq 3.5$  or less. Chromium oxide, yttrium oxide have been found to be particularly suitable because they appear to have an extra high stability during electron bombardment occurring in a display.

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Therefore it would have been obvious to one of ordinary skill in the art at the time invention was made to have the surface of the spacer coated with a film having secondary electron emission coefficient of 3.5 or less and high oxygen content as taught by Hoosteen et al. for reducing the number of secondary electrons emitted along the support structure sides.

### ***Allowable Subject Matter***

Claims 10 and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reason for allowance: The prior art of record neither shows nor suggests the uneven geometry on the surface of the spacer consisting of the cycles periods of at least two kinds of unevenness.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U. S. Patent No. 5,726,529 to Dean et al. and U. S. Patent No. 6,236,157 to Pan et al. disclose different spacer structure coating.

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EP 0 405 262 A1 to Nonomura et al. discloses flat panel display device with plurality of struts formed between the face plate and back plate to prevent spark discharge.

**Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.  
Sikha Roy  
Patent Examiner  
Art Unit 2879

N/C.  
NIMESHKUMAR D. PATEL  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800